wide variation exists in their response to the same exposure. An absence of chlorophyll makes for increased sensitiveness, and the multi-nucleated forms suffer more than the mono-nucleated, and the large forms more than the small. In the testicle the rays show an essentially selective action, the seminiferous epithelium being destroyed by a dose to which the cells of Sertoli are indifferent. Certain tissues are highly sensitive to the X-rays—notably lymphoid tissue, cartilage, and the endothelium of blood-vessels. Within limits it is true to say that very rapidly growing cells are most affected by irradiation. But it is important to note that different rays give rise to different effects upon one and the same kind of cell, and "a careful distinction should be made between the differential action which different rays have upon the same variety of cell, and the selective action which the same kind of radiation has upon the many different varieties of cells." The X-ray spectrum covers a range of many octaves of wave-length.

If we consider a single cell, we find it exhibits a widely varying degree of reaction (to irradiation) according to the particular phase of its life cycle in which it happens to be at the time. Thus certain ova are nearly eight times as vulnerable to β-rays when they are in an active state of division as when they are in a resting stage. This fact indicates one of the difficulties of quantitative investigations upon living tissues. The chemical composition of a cell may determine the degree of change brought about by irradiation. In sections of malignant growths cut for the microscope before and after irradiation, the staining reactions point to marked changes in chemical composition, and these go hand in hand with the morphological changes.

The authors have given us a book which cannot fail to appeal to the clinical radiologist and to the laboratory worker. Each chapter has received careful study in the writing, and provides food for thought and suggests scope for further investigation on the part of the reader. The book is well printed in clear type on good paper, and contains many excellent illustrations. There is an index of authors, as well as a full general index.

THE MEDIUM UNDER THE MICROSCOPE

A Contribution to the Study of the Psychology of Mrs. Piper's Trance Phenomena. By Mrs. Henry Sidgwick. *Proceedings of the Society for Psychical Research.* Part lxxi., vol. xxviii, December, 1915. Pp. xix+657. (Glasgow: R. Maclehose and Co., Ltd., 1915.) Price 12*s*. net.

WILLIAM JAMES once referred to Henry Sidgwick as "the most exasperatingly critical mind in England," and the whimsical compliment was well deserved. After the death of the famous professor of moral philosophy, the mantle of the arch-critic fell naturally on the shoulders of one of Sidgwick's most able pupils, Mr. A. J. Balfour, whose "Defence of Philosophic Doubt" was as destructive as we hope our Navy will be under his First Lordship; but now that he has reached a more constructive period, as evidenced by his recent "Theism and Humanism," the pallium passes to his sister, the professor's widow, and late principal of Newnham College. Anyone who is not willing to believe unquestioningly what has successfully passed the ordeal of her scrutiny must be constitutionally unable to believe anything. If she were censor the newspapers would have to cease publication, for she would never believe any but official reports, and probably not them.

In this bulky volume Mrs. Sidgwick discusses the phenomena of the famous Boston medium who has been for twenty-five years almost continuously under the supervision of various eminent scientific men, including Prof. James—who was an M.D. as well as the apostle of Pragmatism—and Sir Oliver Lodge. This lady began to experience sleep-like trances in 1884, but they were only sleep-like so far as concerned Mrs. Piper's normal consciousness, for her tongue talked—or, later, her hand wrote—in a very wideawake fashion. What was there, in place of Mrs. Piper's normal consciousness, which certainly was *not* there, furnishes the theme of Mrs. Sidgwick's discourse. First, ostensibly, came a Dr. Phinuit, a "spirit" who said he had been a doctor in Metz. Investigation failed to trace his earthly career, and his knowledge of French was scanty—seemed, in fact, about like Mrs. Piper's. But the queer thing was that this dubious entity could usually tell sitters quite a lot about their deceased relatives, and he professed to get the information from the relatives themselves, who were with him in the spiritual realms. This kind of thing happened freely, even when the investigators introduced sitters from a distance—people entirely unknown to Mrs. Piper—anonymously or pseudonymously. Then another spirit turned up—George Pelham, a lawyer formerly known to the Society's chief investigator, Dr. Richard Hodgson—who gave any amount of identification evidence about himself, recognising his friends and greeting them by name in astonishingly correct fashion. Later there appeared various characters in early history. Lastly came Hodgson, who had died in 1905; but his evidence is not very weighty, because he was known to Mrs. Piper, and consequently we must assume that any given would-be identification-fact may also have been known to her.

Now what about all these "controls" and "communicators"? What are they, anyhow? Spirits, as they allege, or dream-personalities, fragments of Mrs. Piper's subliminal or hypnotic consciousness? Mrs. Sidgwick thinks the latter; and most people will agree with her rather than weigh all her arguments, which are lengthy and complicated, though the historical part of the book is easy and interesting. She admits, however, that Mrs. Piper's trance utterances contain a great deal of matter which Mrs. Piper has not learnt through the known sensory channels. This dis-

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poses of the fraud-theory. Some of this matter may be due to thought-transference ("telepathy") from living people; but in some cases it seems almost necessary to admit telepathy from the so-called dead. Particularly is this the case in regard to George Pelham, whose evidence is given in an earlier volume of "Proceedings"—No. 13.

All investigators admit that the evidence in that volume is impressive, and that the Piper case as a whole is remarkable. It is still more remarkable, perhaps, to find so cautious a mind as Mrs. Sidgwick's accepting communication from the dead as a reasonable hypothesis, even though she does dignify it with the sounding title of telepathy through a personation or subliminal fraction. Certainly the evidence does seem beginning to appear conclusive or almost so. It can no longer be "vanquished with a grin." Perhaps in due time it may become so strong that man's survival of death will be a scientific as well as a religious belief. Meanwhile, such volumes as that under notice are very welcome as showing a *via media* between extremes of credulity and incredulity, which are equally unscientific and regrettable.

J. A. H.

ANALYTICAL AIDS FOR FACTORY CHEMISTS.

Solvents, Oils, Gums, Waxes, and Allied Substances. By F. S. Hyde. Pp. vi+176. (London: Constable and Co., Ltd., 1915.) Price 8*s*. 6*d*. net.

At the moment the factory chemist is very much before the public. The university-trained man complains of the very inadequate reward which he can obtain for his labours. The manufacturer is reported to be dissatisfied with the chemist fresh from the university, and all parties criticise the present methods of training. It might be at least expected that the technical chemist should know chemistry, meaning thereby a full knowledge of the properties, preparation, and manipulation of the commoner substances, both inorganic and organic; that he should understand the spirit of research and how to set about a problem; that he should be versed in getting up the literature. The fact is, such chemists are rare; a real knowledge of chemistry, particularly organic chemistry, is largely neglected. As a consequence special text-books are provided for the use of factory chemists, such as the one before us. It contains in the minimum number of words a short statement as to the properties of a variety of organic substances, and will serve as a useful adjunct to the memory of the properly trained man. In the hands of others it is more likely to mislead, since as a result of the condensation necessary, the information is often scrappy and unequal, and the true spirit of organic chemistry is missing.

For example, the statement that dextrose is less sweet than cane sugar, though true, in no way conveys the proper idea to anyone imperfectly acquainted with the great difference between the two sugars in appearance and in crystalline character. Glucosides are defined as substances which "on fermentation" or by hydrolysis yield glucose. Ethyl alcohol is dismissed in nine lines! Ten pages suffice for the alkaloids and bitter principles.

As a whole, the book is well done; it is full of information, accurate and up-to-date, particularly as regards the sections devoted to oils, fats, and waxes, which occupy more than half the contents. This branch of chemical analysis involves the use of a number of special methods, largely empirical in character, and usually labelled with the names of their proposers, with which the would-be expert must be acquainted. For this purpose he will find Mr. Hyde's book most helpful.

It will be much more to the advantage of the individual worker as well as of the works laboratory, however, if information be sought from the larger manuals of chemistry and the critical faculty in analysis is cultivated, instead of striving more or less mechanically to carry out operations as quickly as possible, by following explicit instructions without any real understanding of the chemistry of the reactions concerned.

ASTRONOMY FOR JUVENILE READERS.

A Voyage in Space: A Course of Six Lectures "Adapted to a Juvenile Auditory" delivered at the Royal Institution at Christmas, 1913. By Prof. H. H. Turner. Pp. xvi+304. (London: S.P.C.K., 1915.) Price 6*s*. net.

The voyage in space which forms the subject of this book is not a romantic flight of the imagination, such as might have been written by Jules Verne, but an account of a journey by telescope. In other words, it is an elementary book on astronomy, and is founded on a course of lectures to young people at the Royal Institution. Following the example of Faraday on a similar occasion, the author has retained the language of the lecture room, and has thus been able to preserve the freshness of the original presentation. The reader is necessarily deprived of witnessing the actual experiments, and of seeing many of the pictures exhibited by the lantern, but the descriptions are so vivid and the illustrations so numerous that he will readily imagine himself to be a member of the audience.

The difficulty of leaving the earth in the flesh provides the occasion in the first lecture for an account of gravity in its historical, experimental, and astronomical aspects. Then, in the second lecture, the immense distances which have to be traversed before reaching the heavenly bodies are dealt with, and an interesting talk is devoted to our own atmosphere, which must necessarily be passed through during the first part of the voyage. Telescopes, as the only means of travelling to distant spheres, are the subject of the third lecture, and subsequent lectures deal respectively with visits to the moon and planets, to the sun, and to the stars.

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